Session 2.2

Case Studies - Lessons Learned in Other Disciplines

Day 2

Paper 221

ITS Standardization - Assessing the Value of a Consortium Approach

Jonathan Gifford

ITS Standardization: Assessing the Value of a Consortium Approach

Jonathan L. Gifford
George Mason University
ITS Standards Review and Interoperability Workshop
Dec. 17-18, 1997

Presentation Overview

- Description of consortia
- Case studies
  - non-transport
  - transport
- An ITS Users Consortium

Standardization Processes

- Consortia
- *De facto*
- SDO
- Regulation

The Consortium Approach

- Voluntary organizations
- Independent of any single vendor, user or government agency
- Neutral forum for resolving technical issues and specifications
- Rapid decision cycle (1-2 years)
- Priorities set through grass roots
- Widely used in industry

Consortia Roles

- Usually ***NOT*** an SDO
  - Voluntary, non-mandated
  - Self-defined procedures
- Develop specifications
- Compliance testing
- Coordination with SDOs
- Budgeted out of member dues

Types of Consortia

- Supplier Consortia
- User Consortia

jgifford@gmu.edu

Information Technology Consortia

- FireWire (IEEE 1394)
- Infrared Data Association (IrDA)
- World Wide Web Consortium (W3C)
- GSM (global cellular phone standard)

12/18/97 Jonathan Gifford (jgifford@gmu edu) 7

Examples of Consortia in Transportation

Europe

- IntraGSM
- Global Specification for Short-Range Communication (GSS)
- Global Tolling System (GTS)
- American Transit Standards Consortium

United States

- I-95 Coalition
- Transcom
- Advantage I-75
- HELP/Crescent
- Railroad Automatic Equipment Identification
- Railroad Automatic Equipment Identification
- E-ZPass Interagency Group
- GIS-T

12/18/97 Jonathan Gifford (jgifford@gmu edu) 8

FireWire (IEEE 1394)

- Digital interface in the form of a physically small, thin serial cable
- Enables direct digital data exchange between devices
  - No digital-to-analog--analog-to-digital conversions

- **Development**
  - *September 1994* - 1394 Trade Association formed
  - *Fall 1995* - First major FireWire product announcements (COMDEX Trade Show)
  - *Late 1995* - The First Products with 1394 are Introduced on the Market
  - *FireWire Today* - 41 member companies
- **Important Observations**
  - Close coordination with SDO's
  - Deployed into highly diverse product market (consumer electronics)

12/18/97 Jonathan Gifford (jgifford@gmu edu) 9

Infrared Data Association (IrDA)

- Main Feature
  - Enables wireless printing, data exchange
- Development
  - *1989* - Hewlett Packard initiates, contacts ~60 manufacturers
  - *June 28 1993* - IrDA is organized as a formal consortium
  - *June 30 1994* - The First IrDA Standard is Approved
  - *Current Status* - 150+ members drawn from major hardware, systems, software, peripheral, component, and communications manufacturers, cable and telephone companies, and service providers
- Important Observations
  - Developed as a consortium because no market leader
  - Rapid development - 1 year and 2 days

12/18/97 Jonathan Gifford (jgifford@gmu edu) 10

World Wide Web Consortium(W3C)

- Purpose. "develop common protocols to enhance the interoperability and lead the evolution of the World Wide Web "
- Activities organized into three "domains"
  - user interface
  - technology and society
  - architecture
- Domain investigates/leads development in activity areas
  - E g , XML (extensible markup language), successor to HTML (hypertext markup language)

12/18/97 Jonathan Gifford (jgifford@gmu edu) 11

W3C Development

- Established in October 1994
  - MIT Laboratory for Computer Science (MIT/LCS), CERN, DARPA, European Commission
- Today jointly hosted
  - MIT LCS, INRIA (France, April 1995), Keio University (Japan, August 1996)
- Director: WWW inventor Tim Berners-Lee
- 230 members (12/4/1997)
- Funded by member dues ($50K or $5K)

12/18/97 Jonathan Gifford (jgifford@gmu edu) 12

W3C Observations

- Coordinates with IETF
- Fast decision making
- Authority in Director
- Problems keeping up
  - -"Web year" 3 months
  - – Browser "brownouts" and "blackouts"

12/18/97 Jonathan Gifford (jgifford@gmu edu) 13

GSM (Global System for Mobile Communications)

Development

June 1982 European Conference of Posts and Telecommumcatlons Administrations (CEPT)
- ***Forms Groupe Speciale Mobile***
- . Recommends ***reservation of two blocks near 900 MHz***

June 1985 -West Germany, France and Italy sign agreement for the development of GSM

1987-Memorandum of Understanding (MoU) slgned in Copenhagen by Operators from thirteen countries

1992 - First commercial GSM network in service

1992 - Australian operators are first non-Europeans to sign MOU

12/18/97 Jonathan Gifford (gifford@gmu.edu) 14

GSM (Global System for Mobile Communications)

- Development (Cont'd)
  - 1993 30 GSM networks. 1 Million customers, 70 MoU members from 45 countries
  - *GSM Today* - 130+ networks, 12 million customers.150 MoU members from 90 countries
- Important Observations
  - – Started as consortium of public organizations
  - – Explosive user adoptlon

12/18/97 Jonathan Gifford (jgifford@gmu edu) 15

Railroad Automatic Equipment Identification (AEI)

Association of American Railroads (AAR) standard for North American AEI deployment

. Development
- Late ***60s - AAR adopts optical ID system (automatic car identification, ACI)***
- ***Early 70s - Full*** scale adoption ***of ACI***
- ***Late 70s -Abandonment*** of ***ACI***
- 1986 - begin new search for ID system
- 1988 - AAR establishes AEI Committee
- 1989 fall - Decision: technology, tag format (ISO compatible)
- ***1990 summer*** - Decision: 2 tags/car, sidemounted

12/18/97 Jonathan Gifford (jgifford@gmu edu) 16

Railroad Automatic Equipment Identification

Development (Cont'd)
- 1990 ***July*** - AEI Commlttee requests mandated lmplementatlon date
- 1991 ***September*** - AAR mandates standard for car exchange
- 1997 ***December-*** Large railroads agree to pay for installation of AEI tags on all private fleets

Important Observations
- *– 3 years from committee formation to standard*
- *– Compatible with ISO container standard*
- *– Unitary ownership of guideway and vehicle important*

12/18/97 Jonathan Gifford (jgifford@gmu edu) 17

E-ZPass

- Regional toll tag for "greater NY"
- Development
  - – 1970s Evaluation of ETC projects begins
  - – Late 1980s Test programs on Verrazano-Narrows and Goethals bridges
  - – 1989: Port Authority and TBTA begin negotiations on regional cooperation
  - – 1990: Policy Committee formation

12/18/97 Jonathan Gifford (jgifford@gmu edu) 18

E-ZPass

Development (cont'd)
- 1992 Jan Request for Proposal
- 1992 Mar-June Technlcal evaluation
- 1992 June-Dec Field testing (1st round)
- 1992 Dec Receipt of Best & Final Offers
- 1993 Mar 1994 Jan Field testing (2nd round)
- 1994 Mar 18 Contract awarded Mark IV
- 1995 October Tags placed into service
- 1997 (early) operatlonal 570K Issued. 2x expected

12/18/97 Joathan Gifford (jgifford@gmu.edu) 19

E-ZPass Observations

- 5 years to implementation
- Cooperative efforts complicated by:
  - Conflicting procurement procedures
  - Different Implementatlon timetables
  - Different operating requirements
    - barrier vs closed systems
- Continued autonomy essential
- High level commitment essential
- Role of fear of preemption

12/18/97 Joathan Gifford(jgifford@gmu.edu)

An ITS Users Consortium

- Are ITS users well organized to represent their interests in the standards setting process
  - Light participation in SDOs, ITSA by cities, counties. MPOs, states
    - High cost to participate (time, $$)
    - Collective goods often undersupplled
  - SDOs and ITSA may be dominated by suppliers and Federal authorities

12/18/97 Jonathan Gifford (jgifford@gmu edu) 21

ITS Users Consortium Role

- Represent groups of users in SDOs
- Focus explicitly on standards
- Independent of single suppliers or single government agencies
- Addressgaps
  - electromc payment
  - VMS
- Certification/testing (?)

12/18/97 Jonathan Gifford (jgifford@gmu edu) 22

ITS Users Consortium

- Build on successes of other transport/non-transport consortia
- Voluntary
- Avoid duplication with associations (AASHTO, AMPO, APTA)
- Procedural agility-ability to fast track
- Identify and focus on user priorities
- Possible budget savings

12/18/97 Jonathan Gifford (jgifford@gmu edu) 23

ITS Users Consortium Initial Steps

- Identify areas of high importance to users
- Select those that cross user categories
  - e.g , electronic payment
- Survey interested parties
- Identify neutral host

12/18/97 Jonathan Gifford (jgifford@gmu edu) 24

ITS Standardization:

Assessing the Value of a Consortium Approach

Jonathan L. Gifford[1] and Odd J. Stalebrink[2]
George Mason University

Abstract

Standards for intelligent transportation system (ITS) equipment has been called for since the outset of the current ITS movement a decade ago. But progress towards standardization has been slow. This paper begins with an overview of different approaches for developing standards. These are consortia standards, *de facto* standards, standards development organizations (SDOs) and regulatory standards. Next, it presents case studies of consortia-based standards, both in ITS and in other sectors. Finally, it suggests conditions under which consortia might accelerate standardization.

Introduction

Standardization of intelligent transportation system (ITS) equipment has been called for since the outset, a decade ago, of the current ITS movement with the development of *Mobility 2000* in the U.S. and *Drive* in Europe. Standards are widely viewed as an essential precursor to the widespread deployment of ITS equipment and services.

Standards at the national or international level would have several potential advantages:

- *Economies of scale:* Standards would allow equipment suppliers to exploit economies of scale in the development, production, distribution and maintenance of equipment. They could avoid the cost of developing customized products and services for individual customers.
- *Interoperability:* Standards would allow the use of the same equipment and services in different geographic locations within the U.S., throughout the Americas, or globally. Standards would also allow interoperability between different ITS applications, for example, between emergency roadside service and electronic payment.
- *Procurement:* Standards could simplify the procurement of ITS equipment for public sector agencies where regulations may prohibit specification of equipment that is proprietary to a single manufacturer. Moreover, international standards can be useful for national markets that may be too small to develop or support their own standards such as Hong Kong or Australia.

---

[1]Associate Professor of Public Management and Policy, Department of Public and International Affairs and The Institute of Public Policy, George Mason University, Fairfax, VA 22030, U.S.A. (tel. 703-993-1395; fax 703-993- 1399; Internet: j,aifford@gmu.edu).
[2] Graduate Research Assistant, The Institute of Public Policy, George Mason University, Fairfax, VA 22030, U.S.A. (tel. 703-993-2275; fax 703-993-1399; Internet: ostalebr@gmu.edu).

At the same time, standards also have several potential disadvantages:

- *Delay*: The standards development process can often be painfully long, especially when a standard setting process involves several industry sectors.
- *Impedance of Innovation:* Standards, once adopted, may have the effect of preventing or delaying the introduction of potentially beneficial technologies or services that are incompatible with the standard.
- *Orphan Technology:* Standards may damage early adopters of systems that are not compatible with the standard.
- *Limited Competition:* In some cases, proprietary standards may limit competition in initial or subsequent procurements. as suppliers who monopolize a standard may "hold up" customers.

It should be noted with regards to the above potential disadvantages that "gateway" technologies can, in some cases, enable interoperability between previously incompatible systems, which may enable the introduction of innovations. Gateway technologies may also reduce the incidence of orphans.[3]

The main point of this paper is to illustrate how one approach to standards development, consortia, might help to accelerate standards development. It is organized in three sections. The first section provides a brief introduction to the different types of institutions and processes that standards result from. The following section presents a set of thumbnail case studies of consortia standards. The final section provides a discussion regarding the various conditions under which consortia might be amendable. This is done with regards to ITS standardization and the management of interoperability of ITS facilities and equipment.

Standardization Institutions and Processes

Standards result from four different types of institutions and processes. This paper is primarily concerned with one of these. the consortium, whereby users or suppliers join together to establish or endorse a particular standard or specification. The World Wide Web Consortium is an example. Under a second approach, the market may adopt technologies that become "*de facto*" standards by virtue of their dominance of the market. Examples include Microsoft's Windows and Windows 95 software. A third process is development through accredited standards development organizations (SDOs). The American Society for Testing and Materials (ASTM) is an SDO, for example. A fourth approach to developing standards is through the adoption of laws and regulations, as in the cases of auto fuel economy and tailpipe emission standards. The remainder of this section provides a brief description of these four approaches to standards development.

Consortia

Under a consortium approach to standardization, a group of interested suppliers or users of a particular system or component convene and develop a standard for it. One of

[3] Paul A. David and Steve Greenstein, "The Economics of Compatibility Standards: An Introduction to Recent Research," *The Economics of Innovation and Network Technologies* 1(1990), pp. 3-41.

the hallmarks of consortia-based standards is that they can be developed quickly and consequently allow products and services to reach the market faster. Consortia are widely used in the computer and telecommunication industries. Hewlett-Packard, for example, participates in several hundred standards consortia worldwide.[4]

Examples of consortia standards include the World Wide Web Consortium (W3C), which produces software and specifications for the World Wide Web, including HTML (hypertext markup language), used for laying out web pages, and a successor called XML (extensible markup language).[5] Another consortium is the Infrared Data Association (IrDA), which developed the standard for the infrared data link used in wireless printing and wireless networking applications. In the area of ITS, the E-ZPass toll tag specification was developed using a consortium approach. Consortia are also being formed in Europe to sponsor the development of electronic toll payment standards.

A subsequent section of this paper contains thumbnail case studies of several consortia standards, which are widely used in computing and telecommunications sectors.

De facto Standards

A *de.facto* standard is a design or protocol that dominates the market through the unorganized actions of suppliers and consumers, without any formal adoption or enforcement by non-market or regulatory bodies. *De.facto* standards are often associated with a single manufacturer, or in some cases a single customer.

Examples of *de facto* standards abound. Microsoft Corporation's DOS and Windows software dominate the personal computing market. The *de facto* standard for computer printer commands is PCL (printer control language). It was developed by Hewlett-Packard (HP) and succeeded because of HP's dominance in the printer market. VHS is the *de facto* standard for videocassettes and cassette recorders.

The ownership of the intellectual property rights of a *de facto* standard can be open, subject to licensing. or proprietary. Openly available standards may be adopted and utilized by any manufacturer, user, or secondary supplier. The owner of the standard may also license its use to other manufacturers or secondary suppliers, possibly requiring the payment of a licensing fee or adherence to other licensing requirements. These requircments may range from simple labeling to more wide-ranging requirements governing the provision of end-user support or the bundling of licensed products with competing products. Finally. the owner of a standard may treat it as proprietary and restrict its use by any but selected secondary suppliers or even treat its technical specifications as trade secrets and refuse to divulge them.

There are two primary concerns about *de.facto* standards. First, the owner of a *de facto* standard has market power, which it may use to retain customers and increase market share. Microsoft's requirement that personal computer manufacturers who install its Windows 95 software also install its Internet browser, Internet Explorer. is an example of

[4] Brian D. Unter. "The Importance of Standards to Hewlett-Packard's Competitive Business Strategy," *ASTM* Standadization News (December 1996), pp. I3- 17.

[5] Jon Bosak and Dan Connolly, "SGML, XML and Structured Document Interchange" (June 10, 1997) <www.w3.org/SML/Acticity.html> (December 9, 1997).

such market power. Indeed, the Justice Department has challenged Microsoft's requirement.

The second major concern is about the technical superiority of de facto standards. Emergence of a *de facto* standard may occur in a number of ways. Consumers may simply prefer a particular manufacturer's design. The timing of a product's release and the restrictions on its manufacture by other suppliers (patents, copyrights, licensing agreements. etc.) can also influence its market share, both through the intentional strategic behavior of a supplier as well as through simple luck or bad fortune. The strength or dominance of a particular supplier may also lead consumers to believe that it will be able to support its products more readily. IBM's dominance in the computer market, for example, gave consumers confidence to buy its personal computer products and establish its early dominance in that market.

Hence, the emergence of a *de facto* standard depends on factors other than technical performance alone. It is theoretically possible for a technically inferior design, favored with a clever marketing and deployment strategy, to gain market dominance over a technically superior design that is poorly marketed. That is, in a market-based competition between two technologies, the "wrong" technology might win. In the view of some, such a "market failure" justifies government intervention.

But others have challenged the necessity-or value-of state intervention. They argue that it is difficult to demonstrate convincingly that the government can do any better than market processes in picking the best technology. Government faces many of the same uncertainties as other market actors in choosing which technology is technically superior. Moreover, state-mediated processes often proceed slowly, especially when multiple parties are contending for a state imprimatur. Benefits that might have been generated during the period of contention may or may not exceed the future incremental benefits of any technically superior selection produced in the state-mediated process. Furthermore. state intervention in the interests of improving the technical performance of products runs the risk of stifling adoption. A state-mandated design-selected on the basis of a finding of technical superiority-could fail to succeed in the marketplace, because of. say. flawed marketing, and lead to a worst case outcome of no adoption whatsoever.

A further difficulty arises from technical improvement. Consider technology *a*, which is technically inferior to *b* but wins out over *b* because of better marketing. As the volume of production of *a* increases, it is likely that its technical performance will improve and its unit costs decline, perhaps at some point surpassing *b*'s performance at the earlier point. Of course. if *b* had been successful at the outset, its technical performance and unit costs would have improved with volume of production as well. The "optimal" choice between *a* and *b* therefore depends upon the trajectory of their respective technical performance and unit costs.

There has been an energetic debate over the merits of market- versus state-mediated technology choices, citing such cases as typewriter and computer keyboard layouts and the format of videocassettes and videocassette recorders. Neither perspective appears to be definitively more or less applicable to ITS at this point.[6]

Standards Development Organizations

A third standards development channel is the formal standards development organization (SDO). SDOs are usually organizations or associations that develop standards for a particular technical area such as telecommunications or automotive design. Most SDOs in the U.S. register with the American National Standards Institute (ANSI), which accredits SDOs that observe its required procedures. These are designed to ensure that standards development processes are open to all interested parties and that the proprietary interests of one supplier, manufacturer or other stakeholder do not place others at a disadvantage. Requirements include detailed rules for balloting of SDO actions and for addressing the concerns of any dissenting views.

ANSI is the U.S. representative to the International Standardization Organization (ISO) based in Geneva, Switzerland. IS0 is a global SD0 that convenes technical committees to develop and coordinate standards at a global level.

One characteristic of ANSI-accredited SDOs is that they often develop standards quite slowly. While procedural requirements are intended to serve the public interest, they also introduce the potential for significant delay. Sometimes, suppliers in a particular industry can agree readily on a standard, but when the process is opened to all sectors of all industries, this ability breaks down. If all parties cannot reach agreement, standards may remain in the draft and revision stages for years.

Many of the procedural requirements of formal SDOs grew out of real and perceived abuses of industrial standards organizations to win competitive advantage. In one important case, a boiler manufacturer used its influence on a standards-setting committee to exclude a competitor's valve from the market. Later, Ralph Nader and the Center for Auto Safety alleged in *Unsafe at Any Speed* that industry-based safety standards were inadequate because they sacrificed public safety to corporate profit.[7]

The resulting procedural requirements sought to ensure that the public interest would be represented in standards setting processes by requiring open meetings and broad participation. The requirements for ANSI accreditation are a direct result of these concerns over the integrity of the standards setting process.

---

[6] For a discussion of the general issue, see S.J. Liebowitz and Stephen E. Margolis, "The Fable of the Keys," *Journal of Law and Economics* 22 (April. 1990), pp. l-26; for a discussion in the context of ITS see J.L. Gifford. "Standards for Intelligent Vehicle Highway System Technologies," *Transportation Research Record,* no. 1358, 1992, pp. 22-28, and J.L. Gifford and Jean-Luc Ygnace, "Technology Standards and Deployment of Advanced Transportation Technologies: A Comparative Case Study of Electronic Toll and Traffic Management (ETTM) in the United States and France," in *Applications of Advanced Technologies In Transportation Engineering,* Yorgos J. Stephanedes and Francesco Filippi, ed. (New York: American Society of Civil Engineers. 1996), pp. 535-541.

[7] See Robert W. Hamilton, "The Role of Non Governmental Standards in the Development of Mandatory Federal Standards Affecting Safety or Health," *Texas Law Review* 56 (8) (1978), p. 1374.

Regulation

A fourth standards development approach is the regulatory standard, whereby government, through its own procedures, adopts standards embodied in formal, legally binding regulations. One of the hallmarks of the previous three channels was their voluntary nature. Regulatory standards put the force of law behind a standard, and they are thus bound in the U.S. by the Administrative Procedures Act's requirements for notice and public involvement. Regulatory standards, while appropriate in some cases, face a number of obstacles. Among these is the difficulty of keeping the standard current with what may be a rapidly evolving technology, one that is shared by formal SDOs.

Interaction between Standards Development Processes

The boundaries between these four categories of standardization processes are not crisp. Government bodies often adopt codes or standards developed by SDOs, for example in the case of housing codes. Or governments may modify a standard developed by an SDO. Consortia may develop model specifications that provide input for SD0 consideration. Or consortia may adopt or modify an SD0 standard for a particular purpose. In the case of the World Wide Web Consortium, for example, the specification XML is based on the ISO's Standard Generalized Markup Language (SMGL. IS0 8879).[8]

Thumbnail Case Studies of Consortia Standards

In order to examine the applicability of consortia for ITS standardization, the paper next presents thumbnail case studies of several consortium standards processes. These are selected from both inside and outside the transportation domain.

IEEE 1394 (FireWire)

FireWire is a digital interface in the form of a physically small and thin serial cable. It allows transmission of digital data between digital devices without analog conversion, which preserves signal quality. A typical application of FireWire would be a digital video camera sending digital video data to a digital monitor on a remote computer that is connected to a digital VCR and a printer. Since the video signal carried on the FireWire cable is digital, each device can process the video directly in digital form without the expense and loss in image quality incurred when converting back and forth to analog video. There is no need for a video capture card or any analog-to-digital video conversion, since the entire data path is digital. The monitor, computer. and VCR accept the digital data and display or store the data as appropriate. A video frame could be sent to the printer for hard copy.

FireWire was originally conceived by Apple Computer.[9] The idea of developing FireWire as an industry standard arose in response to a lack of compatible standardized interfaces that allowed digital data to be transferred from one digital device to another, without first converting it to analog and then back.

---

[8] Bosak and Connolly, op. *cit*

[9] Franco Vitalioano. "Why FireWire is Hot! Hot! Hot!" (n. d.) <http://www.vxm.com/2 1 R.35.html> (Dec. 15, 1997).

The first products using FireWire were presented in fall 1995 at the COMDEX trade show. Sony demonstrated its DCR-VXlOOO and DCR-VX700 Digital Video cameras with IEEE 1394 output. Texas Instruments displayed its new 200 Mbps Physical Link chips and a prototype IEEE 1394 front end for a printer. Molex featured its IEEE 1394 cable technology. Apple demonstrated a prototype digital video system. And Skipstone showed its second generation IEEE 1394 developer software and computer adapter as well as a prototype IEEE 1394 front end for a Mitsubishi video monitor.

FireWire's main competitor is the Intel Universal Serial Bus (USB). However, the maximum data transfer rate on the USB is 12 megabits/second (mbs) compared to FireWire's 100-400. As a result, the USB may be best suited to applications such as computer telephony and keyboard and mouse communications.[10]

Shortly after the 1995 COMDEX trade show Sony introduced the first products with 1394 on the market, two consumer digital camcorders that use 1394 to send images in a new compressed digital-video format called DVC.[11]

The organizational development of FireWire combined an IEEE standards committee with a consortium. Interested parties formed a standards committee within IEEE and the standard was assigned the number 1394. To formalize the idea of IEEE 1394 and to accelerate its market adoption, a consortium called the 1394 Trade Association was formed in September 1994. Of special importance are the technical working groups that focus on extending the IEEE 1394 specification. The Trade Association is composed of 41 member companies. Some of these are Sony, Mitsubishi and Matsushita from the consumer electronics field; Apple Computer, IBM, Sun and Microsoft from the computer industry; Texas Instruments, National Semiconductor, Advanced Micro Devices and Cirrus Logic from the semiconductor industry; and Skipstone for IEEE 1394 developer tools and OEM solutions.[12]

Infrared Data Association (IrDA)

Another example of an industry consortia standard is one for infrared communications between computer products to allow wireless printing and data exchange. Infrared data exchange is familiar to most consumers in the form of remote controls for televisions and other consumer electronic devices. An infrared transmitter and receiver are aligned and activated in order to transfer data between devices, such as television and remote control, or computers and printers.

In the late 1980s. there were five major competing IR technologies. These were HP's proprietary SIR (serial infrared interface), Sharp's ASK, GMI's Magic Beam/Motorola, IEEE 802 11 and diverse IR remote controls.

[10] *Ibid*
[11] "Combined with 1394, DVC will likely replace motion JPEG as the compression standard for video editing. DVC removes all vestiges of analog signals from video production, and its image quality surpasses laser-video disc and professional Betacam formats." Daniel Moore, "IEEE 1394: The Cable Connection to Complete the Digital Revolution," Feb. 15. I996 <www.vxm.com/index.html> (December 1, 1997).
[12] *Ibid*

Hewlett Packard had successfully developed standards that became *de facto* standards in the past. Its PCL (printer control language) and HP GL (graphic language) were *de facto* standards for communications between personal computers, printers and plotters.

A *de facto* standard did not work in the infrared case, however, because no single supplier dominated both the printer and the laptop computer markets. Thus, it was necessary to convene multiple suppliers who might utilize wireless data exchange and printing and agree on a standard. In 1989, Hewlett-Packard sent letters to roughly sixty manufacturers and received sufficient response to proceed. The group organized as a formal consortium on June 28, 1993 as the Infrared Data Association (IrDA). The first IrDA standard was approved June 30 1994, 1 year and 2 days after the first meeting. Since 1994, the association has defined common industry standards for reliable, small, low-cost and two-way cordless data communication ports based on infrared data.

IrDA formally incorporated at the end of 1993. Its stated strategy was, and is, "to create and promote interoperable, low cost infrared data interconnection standards that support a walk-up, point-to-point user model."[13] In order to implement this strategy, IrDA formed three committees. The steering committee, which has overall responsibility for the direction and activities of the organization. The committee has one representative from each member, regardless of their size. The technical committee addresses technical issues, both on the hardware and the software side. In order to put technical issues at the forefront, the technical committee also has responsibility for resolving differences in opinion in order to reach majority consensus. Finally, a marketing committee determines user needs.

Today IrDA has over 150 members drawn from major hardware, systems, software, peripheral. component. and communications manufacturers. cable and telephone companies, and service providers. Mobile computers and consumer electronics are increasingly integrating infrared communications into their array of capabilities and many of these adhere to standards created by the Infrared Data Association (IrDA).[14]

E-ZPass

In ITS, an example of a user consortium is the E-ZPass electronic toll and traffic management (ETTM) tag, developed in the New York metropolitan area. Eight toll facility operators in the region joined together to develop common specifications and execute procurement of tags and tag readers in order to achieve interoperability at the vehicle-roadside interface. They began meeting in late 1989, organized themselves as the Interagency Group (IAG) in 1990, and issued a request for proposals in January 1992. After a

[13] "IrDA Fact Sheet." About the Infrared Data Association (IrDA) (n.d.). <http://www.irda.org/irda/factsht.htm1> (December 12, 1997).

[14] Brian D. Unter. Hewlett-Packard, interview with the author (February 4, 1997): Unter, *op cit.;* Robert L. Howie, Jr.. "Competition 2000: Strategic Standardization and International Trade." special advertising section. produced in cooperation with the American National Standards Institute and the World Standards Day Committee, *Business Week* (October 21, 1996); "The Infrared Data Association Home Page," <http://www.irda.og/irda/factsht.html> (December 12, 1997).

two-stage procurement they awarded a contract for Mark IV tags in March 1994. The pass was placed into operation in October 1995.[15]

Of considerable importance in the E-ZPass case was the need to have eight independent agencies, each with an independent procurement process, jointly procure a tag-reader system that would be technically interoperable, so that one tag would work technically on all facilities in the system. The technical tradeoffs were significant. Closed toll systems (i.e., with tolls collected when exiting the system based on the point of entry) required read-write technology. However, open toll systems (i.e., with tolls collected at plazas at strategic points on the main lines) would have been able to utilize read-only technology, which was considerably cheaper than read-write at the time. Yet through the actions of the IAG they were able to reach closure on a read-write tag that would satisfy all of the users' requirements.

Interoperability in user accounts, so that each user could maintain a single account that would allow use of facilities in all eight jurisdictions, was viewed by the eight participants as a potential source of considerable delay and was therefore deferred until later. The New York jurisdictions have now entered into a contract with Lockheed Martin IMS for a clearinghouse, and the New Jersey and Delaware jurisdictions have contracted with a consortium of Chase Manhattan Bank and MFS Network Technologies. The Port Authority of New York and New Jersey initially signed on with the Lockheed contract with the understanding that it would shift to the New Jersey contract once it was in place.

Rail Automatic Equipment Identification

Another example of consortia in transportation is the development by the Association of American Railroads (AAR) of a standard for North American Automatic Equipment Identification (AEI) deployment. A standard developed without government participation, requiring AAR members intending to interchange cars with other member lines to use an AEI transponder standard. [16]

The development of AEI started in 1986 as a second attempt to develop a system that would permit automatic identification of rail wagons. The first system, an optical identification system called Automatic Car Identification (ACI), was abandoned in the late 1970s[17] because it produced a large number of errors and was not economically feasible.[18]

---

[15] Gifford, J.L., L. Yermack and C. Owens. "The Development of the E-Z Pass Specification in New York, New Jersey and Pennsylvania: A Case Study of Institutional and Organizational Issues," Proceedings, Second World Congress on Intelligent Transport Systems, Yokohama. Japan, November 9-11, 1995, pp. 1420-1426: and idem, "E-ZPass: A Case Study of Institutional and Organizational Issues in Technology Standards Development," *Transportation Research Record,* no. 1537 (November. 1996): pp. 10- 14;

[16] M.E. Maggio and J.L. Gifford, "Institutional Issues of Standardization: The Case of Automatic Equipment and Vehicle Identification," proceedings, Sixth Annual Meeting, ITS America (1 996), 11:993-1 000; idem.. "Institutional Issues of Standardization: The Case of Automatic Equipment and Vehicle Identification," ms. (August 28, 1995), pp. 2-8.

[17] Automatic Equipment Identification. A Rail Quality Improvement Program. American Association of Railroads, I991.

[18] Ibid.

It was the Burlington Northern Railroad (BN) that took the first initiative of continuing the search for a more economically feasible and error-free identification system. BN started a testing program in 1986, using radio frequency (RF) based identification systems, in which 9 vendors were asked to present proposals of such identification systems. Two of these proposals were tested on a full scale over a six month period and both system. resulted in an accuracy of 99.99% (General Railway Systems, GRS, of Rochester, New York and Union Switch and Signal Inc. of Pittsburgh).[19] Based on these results BN asked the AAR to form a committee to write an AEI standard for the North American rail industry (August, 1988).[20]

In the end of 1988 AAR established the Automatic Equipment Committee in response to a high level of interest by a number of railroads and shippers. The goal of the committee was to issue a voluntary standard that would provide a common system for railroads wishing to implement AEI.[21] In conjunction with this several railroads including Union Pacific. Norfolk Southern, CSX, and the Canadian National Railway began their own testing programs and passed their results to the AEI committee.[22]

In July 1989, an entry level standard was recommended by the chair of the technical subcommittee of the AAR to serve as a basis for a more complete version.[23] At this time the subcommittee functioned as a mediator that had an opportunity to review the industry requirements in light of the available technology and meet with interested suppliers to assess their potential in satisfying railroad needs.[24]

Regarding the decision making process, the AEI committee solicited proposals from all potential vendors through the trade press. Four vendors responded with proposals. By fall of 1989 Amtech's proposal was chosen for being most price competitive and responsive to industry requirements.[25]

In order to implement the final product the Operating Standards and Practices Committee requested a benefit-cost analysis, in July of 1990. In October of 1990 the Operating Standards and Practices Committee approved the recommended AEI standard and in August 1991 the standard was voted to become mandatory. It was ratified in September 1991.[26]

A last barrier to a full implementation of the AEI standard was the fact that only Class I rail lines participated in the mandatory standard. In order to include privately owned railcars and other equipment, as well as regional and short-line railroads the 13 largest railroads were willing to pay the startup costs of placing AEI tags on all privately

[19] Results of Burlington Northern Railroad Testing, Association of American Railroads'. Communication and Signal Annual Meeting, August 1988.
[20] Automatic Wagon Identification Becomes Reality. Amtech Corporation, Dallas, TX, 1993.
[21] Automatic Equipment Identification (AEI): A Rail Industry Quality improvement Program. Ad Hoc Committee on Automatic Equipment Identification, Washington, DC, July 1991,
[22] Maggio & Gifford (1995). op. cit., p. 8.
[23] Rennick. G. D., Chairperson, AEI Technical Subcommittee, to J. R. Martin, Sr. Assistant Vice-President. Transportation Planning & Joint Facilities, Norfolk Southern Corporation, July 24, 1989.
[24] Maggio & Gifford (199.5). op. cit., p. 8.
[25] Ibid.
[26] "Amtech Corporation Announces AAR Approves Mandatory Automatic Equipment Identification," Southwest Newswire, September 27, 1991.

owned rail cars. It was agreed in December 1991 that they would be installed starting January 1, 1 992.[27] Thus, the standards development process under the ARR consortium took approximately five and a half years.

The Development of GSM

The Global System for Mobile Communications (GSM) is a digital cellular mobile phone system that operates throughout Europe and in much of the rest of the world, including parts of the U.S. and Asia. GSM originated in June 1982, when the European Conference of Posts and Telecommunications Administrations (CEPT) established a team, called "Groupe Speciale Mobile" (hence GSM) to develop a common set of standards for a pan-European cellular telephone network. (GSM currently stands for Global System for Mobile Communications.) CEPT also recommended at that time that two blocks of frequencies in the 900 MHz band be reserved for use by GSM.[28]

CEPT was motivated by a number of problems encountered in the development of analog cellular telephony in Europe. One serious problem was the inability to use the same terminal (i.e., cellular phone) while travelling within Europe. A second was the difficulty of establishing a mobile communications industry in Europe that could compete in world markets because of the small size of the national home markets.[29] Third, by 1986 it was clear that some of the analog cellular networks would run out of capacity by the early 1990s. In response to these problems, a directive was issued for two blocks of frequencies in the 900 MHz band, albeit somewhat smaller than recommended by the CEPT, to be reserved absolutely for a pan-European service to be opened in 1991. [30]

In the meantime the GSM members were progressing with the development of standards. One major decision was to adopt digital rather than analog technology. Digital offered a number of advantages, including improved spectrum efficiency, better transmission quality, and the potential for new services including security. Also, digital could be implemented with VLSI (very large scale integration) technology, which made possible smaller, cheaper terminals. including hand-held. Digital also complemented the development of a European digital wired phone system based on ISDN (Integrated Services Digital Network), with which it would need to interface.[31]

Thirteen European countries institutionalized GSM standards in a memorandum of understanding (MOU), originally signed in 1987. A consortium called the GSM MOU Association administers the MOU. This association has more than 150 members from 90 countries (see Table 1). that romotes GSM on a global basis and support the standardization of GSM within ETSI.[32] which is the European standardization body for telecom-

---

27 Maggio & Gifford (1995) ,op. cit., p. 8.

28 "Grupparbete Distribuerade Databehandlingssystem GSM" (Group Project of Distributed Data Processing Systems) <http://www.dtek.chalmers.se/-d2birk/gsm.html> (11 Nov. 1997); "GSM General lnformation" <http://www.westel900.hu/kapcsolat/gsm_e.html> (10 Nov 1997); Walter Tuttlebee, "You'll Never Walk Alone," *IEE Review* (May, 1997). pp. 99- 102.

29 "Grupparbete Distribuerade Databehandlingssystem GSM," *op cit.*

30 "GSM: The History" <http://www.ericsson.se/systems/gsm/history.html>(11Nov.1997) (I 1 Nov. 1997).

31 Ibid.

32 Brand. Wolfgang. <wolfgang.brand@verkehrstelematik.detemobil.de> "AW: IntraGSM" (n.d). Personal e-mail, (17 December 1997).

Table 1. GSM Milestones	
1982	CEPT forms Groupe Speciale Mobile
1985	West Germany, France and Italy sign agreement for their development of GSM
1987	Memorandum of Understanding (MOU) signed in Copenhagen by operators from 13 countries
1992	First commercial GSM network begins service
	Australian operators are first non-Europeans to sign MOU
1993	30 GSM networks operational, 1 million customers, 70 MOU members from 60 countries.
1994	60 networks. 4 million customers, 100 MOU members from 60 countries
1995	120 networks, 12 million customers, 150 MOU members from 90 countries
1996	133 networks (as of June)
Source “The History of GSM” <Http://www.gsmworld.com/historv/page5.htm> (November 11, 1997); “Grupparbete Distribuerade Databehandlingssystem GSM (Group Project of Distributed Data Processing Systems)” <http://www.dtek.chalmers.se/-d2birk/gsm.html> (November 11, 1997).	

munications, both mobile and fixed. The members range from government ministries to private telecommunications providers.

IntraGSM

A third example of a transportation-related standard developed through consortia is the ITS platform IntraGSM (International Trans-European Traffic Telematics based on GSM). Although the standard failed before reaching the market, IntraGSM reached a stage in which a standard and a platform of GSM and Global Positioning Satellite or Global Positioning System (GPS) was developed, and an memorandum of understanding (MoU) with manufacturers was signed, along with Deutsche Telekom and Mannesmann.[33]

The idea behind IntraGSM was to define a system by combining two core technologies, GSM and GPS. This began in late 1994 and continued until 1996 when it failed as a result of the unwillingness of two “key” consortia members, T-Mobil and Mannesmann, to guarantee a contract for production of the units to the manufacturers.

The real initiative for IntraGSM came out of a group within a business unit of T-Mobil called T-Traffic.[34] They convened the coalition to create IntraGSM by inviting D2 (one of the German cellular providers) and the equipment manufacturers to develop the basic GPS/GSM platform. The original hope among the promoters within T-Traffic was that once a standard had been set manufacturers would begin to produce equipment that matched the IntraGSM standard. This notion turned out to be wrong, as manufacturers were not willing to begin producing any equipment without a guaranteed contract. The conveners brought up this problem to senior management at T-Mobil who eventually decided against issuing guarantees in late 1996. That was the end of IntraGSM.

[33] Deutsche Telekom and Mannesmann had received Dl and D2 in the early I990’ies, two licenses in the GSM 900 band.
[34] Brand, Wolfgang. <wolfgang.brand@verkehrstelematik.detemobil.de> " AW: IntraGSM” (n.d). Personal e-mail, (17 December 1997).

Since T-Mobil's rejection in 1996 Mannesmann and T-Traffic[35] have come up with another proposal called GATS (Global Automotive Telematic Standard), which is being promoted by Mannesmann and TEGARON.[36] Having seen that a horizontal platform between GPS and GSM would at this time not work successfully, Mannesmann and TEGARON is now promoting the new GATS standard as a "more vertically" oriented or application-oriented standard that will allow a set of standard calls across networks.

World Wide Web Consortium (W3C)

The World Wide Web Consortium (W3C) was founded in October 1994 to "develop common protocols to enhance the interoperability and lead the evolution of the World Wide Web."[37] The W3C's activities are organized into three "domains": user interface, technology, and society and architecture. Each domain has responsibility for investigating and leading the development in several activity areas. An example of an activity is the development of XML (extensible markup language), which is a successor to the widely used HTML (hypertext markup language).

The W3C was established at Laboratory for Computer Science at the Massachusetts Institute of Technology (MIT/LCS). The founding organizations were three: the European Laboratory for Particle Physics (CERN), the U.S. Defense Advanced Research Project Agency (DARPA) and the European Commission. Today, W3C is jointly hosted by MIT LCS, Institute National de Recherche en Informatique et en Automatique (INRIA), which joined in April 1995, and Keio University, which joined in August 1996. Its director is Tim Berners-Lee (MIT), inventor of the WWW, and Chairman Jean-Francois Abramatic (INRIA).

As of December 1997, the W3C had 230 members. Membership is $50,000 per year for full members, and $5,000 per year for affiliate members. Affiliate memberships are available to not-for-profit organizations, governmental departments and agencies, and for-profit organizations with annual revenues less than $50 million per year.[38]

The W3C focuses on a number of problems facing the development of the World Wide Web. One challenge is to keep up with technological advances as cycle times shorten. For example, divergence between Microsoft's Internet Explorer and Netscape is beginning to result in "brown outs" of features, that is, particular features of a site may not be viewable on both browsers. Some of this divergence may be attributable to strategic behavior by the software vendors to induce consumers to use their browser. But some of the divergence is simply due to the pace of technological improvement in browser features, which exceed the capacity of even the W3C to keep up. The "web year" is now shorted to three months according the Bemers-Lee; that is, the browser vendors are re-

[35] Ibid.
[36] Muller T. (October 22, 1997) "Protocol Design for Telematic Services– Individual and Fleet Market Services." 4th ITS World Congress, Berlin, Germany.
[37] "World Wide Web Consortium (W3C) Backgrounder" (November 21. 1997) <www.w3.org/Press/Backgrounder.html> (December 8, 1997).
[38] "How do we Join?" (October 2, 1997) <www.w3.orp/Consortium/Prospectus/Joining.html>(December 9, 1997).

leasing software upgrades every three months rather than the more traditional annual or biannual release.[39]

Another challenge is labeling and possibly controlling the content of web sites. Indeed, W3C recently endorsed a set of labeling guidelines called "PICSRules" that have raised concerns among civil libertarians about the potential for censorship by governments. Moreover, concerns about PICSRules have also raised concerns about the legitimacy of a consortium to establish guidelines that may be used or misused by governments. "The W3C is taking on a quasi-governmental role, and to the extent that the standards it adopts become the basic standards of the Internet, it will have more influence than most national governments will have," said an American Civil Liberties Union representative.[40]

Conditions that Favor Consortia

The above consortia case studies suggest three conditions where consortia standards development may be useful. First, consortia may be useful in situations where technology is changing rapidly. Formal SDOs and government regulatory processes often require months or years to make decisions. When technology cycle times are significantly shorter than the decision cycle. it is quite difficult to produce standards that take advantage of the most recent technological improvements. Of course, consortia are not panaceas, as evidenced by the difficulties with browser divergence being faced by the W3C.

A second condition where consortia may be useful is where the market is changing rapidly, on either the supply or the demand side. A fast technology cycle may relate to change within a particular technology, such as the capacity of digital random access memory (DRAM) chips. Rapidly changing market conditions refer to something different. namely rapidly changing consumer demands and supplier organization. Consumer preferences for products and services may not be well established in a particular area. By the same token, suppliers may be exploring a number of manufacturing, marketing and distribution arrangements.

Often, technology and market conditions co-evolve. Technology enables new and more powerful products and services, consumers learn what products and services are useful. and suppliers learn what consumers value and are willing to pay for.

The desirable organization of an industry involves a tradeoff between flexibility and efficiency. Organizations that are efficient in a static environment may be inefficient in a dynamic environment. and organizational structures that are inefficient in a static environment may be efficient in a dynamic environment.[41]

During periods of rapid structural change in an industry, coalitions, consortia and alliances may be more common. They are more easily dissolved than the development of

39 Steve Lohr, "'Browser War' Limits Access to Web Sites," *New York Times* (December 8, 1997), D1 ff.
40 Amy Harmon. "Technology to Let Engineers Filer the Web and Judge Content," *New York Times* (January 19, 1998). D1 ff.
41 B.H. Klein, *Dynamic Economics* (Harvard University Press. 1987).

new internal division or mergers, their sunk costs are lower, their commitments are less irreversible, and their inertia lower.[42]

A third condition where consortia may be useful is when a subset of users or producers have a strong mutual interest in developing standards quickly in order to capture initiative or shorten time to market for a new product or service. The IrDA consortium documented above is a case in point. While it did not include all potentially affected parties, it did allow a useful technology to reach market rather quickly. The IntraGSM case, on the other hand, demonstrates that the ease of dissolving consortia also allows for greater experimentation than a firm might allow if they had to acquire a new business unit or fully develop a new technology internally.

A Consortium for ITS

The three conditions where consortia may be useful-rapid technology cycle, dynamic market, and strong mutual interest-are present in some domains of ITS. Hence, it may be useful to consider where in the ITS domain consortia might be useful in moving more quickly towards standards and deployment. Indeed, the thumbnail case studies included two from the transportation domain, E-ZPass and rail automatic equipment identification.

The consideration of consortia for ITS raises two important organizational questions. First, what should be the scope of a consortium. Should it, like W3C, be a broad-based consortium for a large segment of an industry? Or should it, like IrDA and FireWire, be more narrowly based on a specific technology?

A second question relates to the representation of users and suppliers in existing ITS organizations. The primary organization representing ITS interests in the U.S. is the Intelligent Transportation Society of America (ITS America), which provides an important locus for coordination with the national government and hosts a set of committees and state chapters that provide broad coverage of ITS issues, including standards. On the other hand, ITS America’s status as a utilized federal advisory committee imposes certain procedural requirements. Also, its broad representation of the industry may make it a difficult forum for decisive action by sub-groups of the industry with strong mutual interests in moving quickly.

Based on the cases reviewed in this paper, some segments of ITS standards activities might benefit from the creation of such a consortium. Transit, for example, has already begun to organize a transit standards consortium.[43]

At the same time, it is important to recognize and guard against the potential for conflict of interest and abuse that precipitated the adoption of the procedural safeguards that in some ways encumber formal SDOs today. In fact, concerns have recently emerged re-

---

[42] C.U. Ciborra, “Innovation. Networks and Organizational Learning,” in *The Economics of Information Network* 91- 102, ed. C. Antonelli (Eisevier Science. 1992).

[43] Eva Lerner-Lam. “An initiative to Establish a Transit Standards Consortium,” draft (Tenafly, NJ: Palisades Consulting Group, Inc., December 15, 1997).

garding the openness of global regulations to non-business interests outside the ITS domain.

A key issue is how to tread the fine line between moving quickly, possibly through the use of a consortium, on one side, and taking actions that injure or may appear to injure the public interest. The controversy over the W3C's PICSRules is instructive in this regard.

Consortia may well provide a valuable addition to the portfolio of organizations working in the ITS standards domain. Consortia may be particularly useful in allowing subgroups of the ITS community to organize rapidly around areas of strong mutual interest, to provide input to formal SDOs and other standards processes, and to provide a forum for representing ITS interest to other standards setting processes outside the transportation domain.

Acknowledgements

The authors wish to thank Kan Chen, Bob McQueen, and Mike Schagrin for their useful ideas and their encouragement of this paper. Any remaining errors are the fault of the authors. An earlier version of this paper appeared as J.L. Gifford, "The Use of Consortia to Accelerate Standardization for Intelligent Transportation Systems," proceedings. Fourth World Congress on Intelligent Transportation Systems, Berlin, Germany, October 2l-24, 1997 (CD-ROM).

[44]Jeff Gerth, "Where Business Rules: Forging Global Regulations That Put Industry First," *New York Times* (January 9. 1998). C1 ff.

Paper 222

Transit Standards Consortium

Eva-Lerner Lam

An Initiative to Establish A Transit Standards Consortium

Eva Lerner-Lam

Palisades Consulting Group, Inc.

Presented at

ITS Interoperability Workshop

December 18, 1997

Why?

- Compelling need for standards in the transit industry
- Lack of a policy forum for facilitating transit standards development, testing, training and maintenance

Why Now?

- ITS activities have heightened awareness
- TCIP has laid solid foundation for consensus-based standards development
- Strong momentum from TCIP Technical Working Group and related Subgroups

Mission of Proposed Consortium

- To faclitate the development, testing, training and maintenance of standards for the transit industry

Objectives

- Establish a policy framework for setting a coherent agenda for transit standards activities
- Enhance--not compete with--existing standards activities
- Administer pooled funds for enhanced transit standards activities

Proposed Structure

- **Hosted** by APTA's Transit **Deve**lopment Corporation
- **Board** of Directors (Chairperson, Executive Committee)
- Technical Council
- Technical Committees (topical and **cross-cutting)**
- **Executive** Director and small **administrative staff**

Key Roles

- Standards Development Organizations continue to fulfill their missions
- Consortium facilitates SD0 activities and fills in gaps for transit industry; provides transit input to other coordinating bodies such as ITS America Council of Standards Organizations

Membership

- Open to all public and private organizations and individuals
- Domestic and international
- Dues structure to encourage diverse membership

Funding

- Membership dues
- Pooled funds for projects

Status of Initiative

- Began in mid-October 1997
- Ad hoc task committee established by TDC Board in late October
- White Paper commissioned by task committee in mid-November, draft circulated for review and comment in early December

Status of Initiative, continued

- Task committee recommendation to full TDC Board by end of December
- Endorsement of concept expected at TRB'98

Ways to Support the Initiative

- **Letters of endorsement/support to TDC**
- **Designation of contact persons for Consortium mailing list**

WHITE PAPER

AN INITIATIVE TO ESTABLISH A TRANSIT STANDARDS CONSORTIUM

BY
Eva Lerner-Lam

Palisades Consulting Group, Inc.
Tenafly, NJ

December 15,1997

This White Paper was commissioned by a task force of the Transit Development Corporation, a not-for-profit corporation affiliated with the American Public Transit Association. Its contents reflect the views of the author, and not necessarily those of the Corporation, APTA or either of their respective boards of directors, officers or members.

WHITE PAPER

AN INITIATIVE TO ESTABLISH A TRANSIT STANDARDS CONSORTIUM

BY
Eva Lerner-Lam
President
Palisades Consulting Group, Inc.

Overview

This White Paper describes an initiative to establish a Transit Standards Consortium. Consortium membership would be open to all public agencies, private companies and other interested parties such as consultants, academic institutions and professional societies. Its mission would be to provide a policy forum and facilitating mechanism for the development and implementation of a coherent, integrated program of standards development, testing, professional capacity-building and maintenance for the U.S. transit industry.

The Consortium would be governed by a Board of Directors representing the major public, private and other stakeholders such as transit properties, the Federal Transit Administration, the Joint Program Office for Intelligent Transportation Systems, Bureau of Transportation Statistics, US Geological Survey (Mapping Division), metropolitan planning organizations, and state departments of transportation; equipment manufacturers, suppliers and vendors; the American Public Transit Association, the Institute of Transportation Engineers, ITS America, the Institute of Electrical and Electronic Engineers, the Society of Automotive Engineers. Technical activities of the Consortium would be proposed and supervised by volunteer technical committees and coordinated by a Technical Council, while the technical work itself would be performed by accredited Standards Development Organizations such as IEEE, ITE and SAE. Day-to-day administration of the Consortium would be handled by an Executive Director and a small support staff.

The administrative operation of the Consortium would be funded by annual member dues and in-kind contributions. Specific transit standards projects would be proposed by technical committees of the Consortium and funded by member dues and “pooled fund” contributions for transit standards projects.

It is proposed that the Transit Development Corporation, a 501(3) c non-profit organization host the Consortium and provide the legal mechanism for the receipt and disbursement of Consortium funds.

The proposed Consortium would leverage the large investments in standards development already made by the transit industry and provide a national policy and technical framework for future transit standards development, testing, professional capacity building and maintenance.

Statement of Need

The transit industry has aggressively pushed for standards for many decades. In the need for a standardized streetcar motivated the establishment of a presidential commission, a blue-ribbon panel of industry experts that worked to achieve the historic "Presidential Commission Car,"for PCC Car." The standardized streetcar specifications enabled equipment manufacturers and transit companies to take advantage of production efficiencies and competitive pricing.

Since then, the industry has been successful in advancing many other consensus standards, including:

- The "White Bus" (Bus hardware specifications)
- SAE J1708/1587 (Vehicle Area Network for buses)
- IEEE Rail Transit Vehicle Interface Standards Committee (Communications and data interfaces for rail transit)
- Transit Communications Interface Profiles (TCIP) (Standardized data elements and messages for electronic transmission of information)

Each of these standards efforts came from specific needs in the industry, and each was funded and promoted by stakeholders, both public and private. However, it is important to note that each standard was developed in relative isolation from other standards efforts within the transit industry, and that funding for development of each standard occurred in haphazard and coincidental ways. (See Figure 1)

For example, the articulation of the need for standardized data elements and messages came about as a result of related efforts by the Intelligent Transportation Systems (ITS) community to standardize data flows for the National ITS System Architecture. The subsequent funding for the standard development effort came from the US DOT's Joint Program Office for ITS. Likewise, the SAE J1708/1587 Vehicle Area Network standard came about as a result of the industry's need for an open standard for on-board vehicle communications, and was funded jointly by several manufacturers and transit properties under the "ITS" umbrella. And while both the TCIP and J1708 standards were consensus-driven and public-private joint efforts, they stand as independent, individual standards, with no coherent framework (except, perhaps, marginally from an ITS System Architecture data flow perspective) within which to consider missing elements or future directions.

Put another way, there is a noticeable lack of an industry-based policy forum in which a national program of transit standards development, testing, training and maintenance can be proposed, evaluated, funded and implemented. The lack of such a policy and technical forum for transit standards makes it difficult to coordinate various standards efforts and misses the opportunity to synergize the individual needs of transit operators, vendors and suppliers into an integrated program of national standards for transit.

With recent heightened awareness and level of activity involving SAEJ1708/1587, IEEE RTVISC and TCIP, the industry is poised to take up the challenge of organizing itself to address the overall needs of the industry for standards.
From a funding perspective, a consortium of public and private transit stakeholders could leverage scarce resources by pooling public and private dollars and applying them within a coherent planning, programming and implementation framework.

Proposed Transit Standards Consortium

The proposed Transit Standards Consortium would consist of public and private stakeholders from private industry, government and academia. Candidate members would include:

- Transit properties
- Equipment manufacturers, suppliers and vendors
- American Public Transit Association
- Federal Transit Administration
- Joint Program Office for Intelligent Transportation Systems
- Transportation Research Board-Transit Cooperative Research Program
- Bureau of Transportation Statistics
- US Geological Survey (Mapping Division)
- National Institute for Standards and Testing
- Metropolitan Planning Organizations
- State Departments of Transportation
- Institute of Transportation Engineers
- ITS America
- Institute of Electrical and Electronic Engineers
- Society of Automotive Engineers
- Others

Membership would be open to all interested organizations and individuals, and a dues structure would be established to fund the administration of the Consortium.

Mission and Objectives

The mission of the Consortium would be to facilitate a coherent national program of standards for the transit industry.

Its objectives would include:

- Promoting the efficiency of the transit business enterprise by facilitating standards development activities
- Supporting and encouraging the efforts of on-going standards activities

- Identifying and prioritizing additional standards activities that would enhance the effectiveness of on-going standards activities
- Funding high-priority standards activities using pooled funds from public and private industry stakeholders

Organizational Structure

The proposed Transit Standards Consortium would operate with a Chairman and a Board of Directors, an Executive Committee, a Technical Council and technical committees. Day-to-day administration of Consortium affairs would be handled by an Executive Director and a small staff. (See Figure 2)

Business/Operations

The Consortium would carry out its mission by engaging in a variety of facilitating endeavors:

- Establishment of a Transit Standards Policy, Plan and Program
  The Consortium would work with FTA, APTA and other transit industry stakeholders to develop a consensus-based set of policies for transit standards development. It would then assist the industry in creating a coordinated plan to integrate and synergize existing standards activities. Finally, it would seek and manage funding to support a coherent *program* of transit standards activities.

- Pooling public and private funds to implement standards development, testing, training and maintenance efforts
  By providing a funding channel for public and private contributions that is open to scrutiny by the industry, the Consortium can provide an important, consensus-based forum for the allocation of contributions for additional or enhanced standards activities.

  For example, with the advent of the National Transportation Communications for ITS Protocol (NTCIP) and the TCIP, several major transit properties and industry manufacturers indicated a willingness to contribute to efforts to enhance certain aspects of those standards in order to address their immediate needs. In the absence of a transit standards consortium, their question, “To whom do we write the check?” had no easy answer.

  With a consortium in place, their contributions could be channeled into a pooled fund, and the consortium might even be able to solicit additional funds from other interested stakeholders to provide supplemental funding. The technical work would be contracted out to an accredited Standards Development Organization (SDO), and the work of the contractor would be supervised by a technical committee of the Consortium. Meanwhile, that effort would be factored into the Consortium’s overall plan and program for transit standards development, and, importantly, other standards development efforts in transit and non-transit-related fields would have a clear point of contact- the transit standards consortium – for information and coordination.

It should be emphasized that the functioning of the Consortium would not displace the efforts of any other existing organization. At present, a transit industry-based forum for an integrated approach to transit standards development simply doesn't exist. Having a transit industry-based forum for prioritizing and programming standards activities that directly benefit the industry also would greatly facilitate the necessary coordination between the industry and other related fields such as ITS, mobile and satellite telecommunications, computing hardware and software, mapping and spatial database management, etc.

- <u>Policy and Technical Studies to Answer Industry's Standards Questions</u>

The Consortium will likely be asked to answer questions such as the need for specific standards and how those standards "fit" into the scheme of things. Such questions would best be answered by policy and technical studies conducted under the supervision of the Consortium's Board, Technical Council and technical committees. These studies would be undertaken under contract to the Consortium by experts and specialists in the standards in question.

- <u>Technical Committees tasked with specific topical areas</u>

The Consortium's Technical Council would establish Technical Committees to deal with specific types of standards issues. For example, the following topical areas might warrant the establishment of individual Technical Committees:

- Transfer connection protection
- Signal priority
- Fare collection (Smart cards)
- Automated Vehicle Location (AVL) polling
- Garage management
- Paratransit

In addition, the following, cross-cutting areas might also warrant the establishment of individual Technical Committees:

- Data interfaces
- Communications protocols
- Mapping and spatial data standards
- Prototype testing
- Conformance testing
- Education and training
- Standards maintenance

Funding Sources

Funding for the Consortium and its activities would derive from two primary sources: member dues/in-kind contributions and stakeholder contributions to a pooled fund for standards activities. (See Figure 2)

A membership dues structure should be established to encourage participation by small and large organizations as well as individuals. Strict rules should be established governing the receipt and allocation of pooled funds and ensuring against conflict of interest and other abuses.

Issues To Be Addressed

In considering whether or not to take on the challenge of establishing a transit standards consortium, the Transit Development Corporation must deal with several issues. These issues can be separated into three general categories: legal, business and funding.

- <u>Legal Issues</u>

The main legal concerns would be liability and trade collusion.

<u>Legal Issue 1: Liability</u>
<u>Discussion:</u> With respect to liability, an element of risk certainly exists. If a standard fails and results in some catastrophic incident, the Transit Development Corporation would likely be named in the ensuing lawsuits, along with many others. However, since the Consortium would only be facilitating the activities of bona fide standards development organizations, the TDC and the Consortium would be one step removed from direct liability. The liability for standards development and maintenance should continue to be assumed by the Standards Development Organizations.

There is another kind of liability related to the Consortium contracting with SDO's and technical support contractors, that is, the typical liability that arises out of any contract for services. As is usual in such matters, both parties should hold the other harmless.

<u>Legal Issue 2: Anti-trust/collusion</u>
<u>Discussion:</u> With respect to anti-trust/collusion, the Consortium would need to place a high priority on setting and enforcing anti-trust guidelines within its policy and technical boards and committees.

- <u>Business Issues</u>

There are several business issues that should be addressed, including: constituting the various boards and committees of the Consortium, coordination with other standards development efforts and organizations, setting rules and guidelines for the receipt and disbursement of funds.

Business Issue 1: Constituting the various boards and committees of the Consortium
The Consortium's Board of Directors would be comprised of representatives of a range of public and private transit-related organizations. Board members would be nominated by a committee of the board, and dues-paying members would be eligible to vote for new members.

The Technical Council of the Consortium would be comprised of the chairpersons of each of the various technical committees. These chairpersons would be nominated by the Chairman of the Technical Council and appointed by the Consortium Board of Directors. Technical Committees would be constituted by the chairpersons appointed by the Board.

Business Issue 2: Coordination with other standards development efforts and organizations
Coordination is at the very heart of the Consortium's mission. Rather than duplicate or compete with other existing standards efforts, the Consortium would incorporate those other efforts into its overall plan and program and serve as a facilitator to resolve any areas of conflict to fill in where high priority needs are pressing. The Consortium could serve as a hosting forum to disparate standards activities and could bring industry experts to bear on issues needing mediation. It could also provide leadership in areas where new ideas and initiative are lacking.

Business Issue 3: Rules and guidelines for receipt and allocation of funds
As with other consortia efforts, there is a risk of conflict of interest and unfair influence by contributing stakeholders. If structured properly and run vigilantly, the Transit Standards Consortium can guard against such abuse. Clear rules and guidelines should be promulgated and strictly enforced to ensure objectivity in all Consortium activities.

- Funding Issues

The most serious issue related to funding is the potential for conflict of interest and abuse of the Consortium's open process for facilitating standards activities for the industry. The Consortium must guard against proprietary influence of a few large contributors in the promulgation of new standards. A clear process must be established in which policy and technical decisions can be made with open dialogue, debate and consensus.

Recommendations to the Transit Development Corporation Task Force

1. Endorse the concept of establishing the proposed Consortium and formally announce the endorsement at TRB 98.

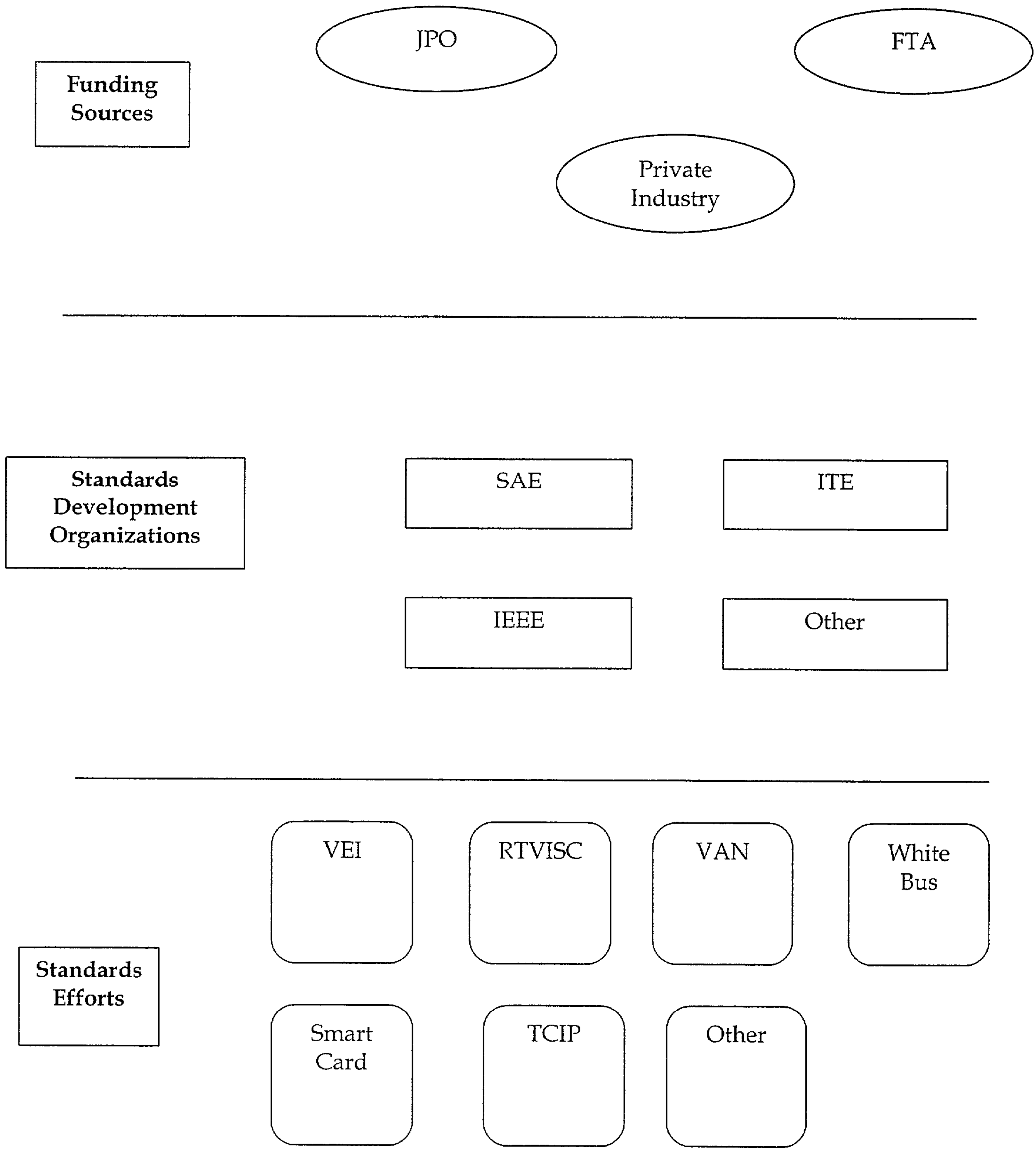
2. Work with FTA and JPO to provide initial funding in FY98 for establishing the Consortium.

3. Initiate several standards activities as pilot projects under the existing TDC structure, with ad hoc technical committees supervising the individual project efforts. (Candidate

projects: TCIP2 (Smart Card), TCIP3 (AVL Polling), and Transit Signal Priority).

4. Evaluate the efficacy of the consortium approach and use lessons learned to establish a formal Consortium within the first 9 months of 1998 (i.e., by the close of the federal fiscal year FY98).

Figure 1
Existing Transit Standards Activities



PCGI

Figure 2
Proposed Transit Standards Consortium